PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s):	Young Hwa Kim et al.	**Examiner:**	DAVIS, Jenna
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Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

I CERTIFY THAT THIS PAPER (ALONG WITH ANY REFERRED TO AS BEING ATTACHED OR ENCLOSED) IS BEING TRANSMITTED TO THE COMMISSIONER FOR PATENTS, P. O. BOX 1450, ALEXANDRIA, VA 22313-1450 ON JUNE 13, 2007, VIA THE USPTO-EFS-WEB FILING SYSTEM

Elaine Reiten

DECLARATION OF YOUNG-HWA KIM UNDER 37 CFR § 1.132

I, YOUNG-HWA KIM, hereby declare the following:

1. I am the founder and Chief Executive Officer of Higher Dimension Materials, Inc. ("HDM"), which is headquartered in St. Paul, Minnesota. HDM invents, develops, and commercializes innovative products that enhance personal safety through synergy of advanced physics, material science, and sophisticated engineering.

2. Prior to founding HDM, I was employed at 3M Company as a research physicist for over 10 years. I was a University/Industry Collaborative Research Fellow at the Supercomputer Institute at the University of Minnesota, St. Paul, Minnesota for four years.

3. I hold a Bachelor of Science in Physics from Seoul National University, Seoul, Korea, a Master of Science in Physics from the University of Houston, Houston, Texas, and a Doctor of Philosophy in Physics from the University of California, Los Angeles, California.

4. One of the innovative products developed and commercialized by HDM is SuperFabric® brand material, a flexible puncture-, cut-, and abrasion-resistant fabric. I am an inventor in U.S. Patent Application No. 10/734,686, filed on December 12, 2003, entitled "Abrasion and Heat Resistant Fabrics" and U.S. Patent Application No. 10/980,881, filed on November 3, 2004, entitled "Supple Penetration Resistant Fabric and Method of Making Same," both directed to SuperFabric® brand material. I am familiar with these applications and the inventions disclosed and claimed therein. I am making this Declaration in support of these patent applications.

5. SuperFabric® brand material has enjoyed commercial success as a result of the unique benefits it provides. SuperFabric® brand material is mechanically strong, resists puncture, piercing, penetration, slashing, cutting, wear, tearing, and abrasion, is highly tactile, and is highly flexible. I am unaware of any other performance fabric that provides this combination of protection, tactility, and flexibility. This unique combination of protection, tactility, and flexibility stems from my invention of printing thin, non-overlapping polygonal plates on a flexible substrate. This invention is found in SuperFabric® brand material. The plates are manufactured from a tough, hard, strong epoxy resin. Small, spaced gaps exist between the plates. The combination of small, hard plates having narrow gaps between the plates printed on a flexible substrate allows SuperFabric® brand material to be locally hard in the plate region while retaining the global suppleness of the flexible substrate across the expanse of SuperFabric® brand material. The flexible substrate distributes forces that impinge upon the flexible substrate or plates, which enhances the strength of the SuperFabric® brand material.

6. The unique combination of puncture, cut, and abrasion resistance with flexibility, bendability, twistability, and tactility found in SuperFabric® brand material results from the innovative process used to manufacture SuperFabric® brand material. SuperFabric® brand material is manufactured by printing a plurality of thin, non-overlapping polygonal or circular epoxy resin plates on a flexible substrate in a pattern having narrow spaced gaps between the plates. The screen-printing process allows for efficient printing of well-defined, small diameter plates on a flexible substrate with small gaps between the plates. The hard,

closely-spaced plates provide penetration, cut, and abrasion resistance while the gaps between the plates allow bending and hinging of the fabric between the plates. SuperFabric® brand material is flexible enough to be used in applications requiring a high degree of dexterity and tactility, such as work gloves, and strong enough to protect against penetration and cuts by, for example, scalpels, needles, and meat-cutting knives. The printing process results in a high bond between the plates and the flexible substrate that does not require any adhesive, rivets, stitching, or other attachment mechanisms.

7. In addition to providing the unique combination of flexibility, tactility, and protection, SuperFabric® brand material can incorporate features enhancing the products manufactured from SuperFabric® brand material. For example, SuperFabric® brand material can be manufactured from a breathable flexible substrate that allows perspiration to evaporate easily. Alternatively, SuperFabric® brand material can be manufactured from a substrate that resists penetration of liquids such as blood or other bodily fluids. Furthermore, the flexible substrate can be washable, thereby allowing products made from SuperFabric® brand material also to be washable. The plate material in the SuperFabric® brand material can be selected to enhance the static friction between the plates and surfaces such as wood, steel, glass, or fish. The flexible nature of SuperFabric® brand material simplifies the manufacture of products incorporating SuperFabric® brand material because it can be rolled, bent, and folded like ordinary fabric.

8. These benefits and advantages provided by SuperFabric® brand material are evident from the broad range of products incorporating the invention claimed in the '686 and '881 patent applications. For example, SuperFabric® brand material is used in technical outerwear, footwear, law enforcement/military/tactical wear, industrial/professional wear, and for cleaning products. Companies that use SuperFabric® brand material and display the SuperFabric® mark include 3M, Scott, Rev'It, Ralph Lauren, North Face, SPIDI, Lindy, Mountain Equipment Co-Op, Mammut, USIA, Lowe Alpine, Samsonite, Timberland, Vasque, Rocky, Damascus, Performance Fabrics, Inc., and Waste Management. Ex. A.

9. SuperFabric® brand material is used in a number of technical outerwear products, for example, motorcycle apparel, snowboarding apparel, ski pants, climbing pants, fishing gloves, mountaineering accessories, bikewear, diving suits, and backpacks. Ex. A, pages 3-17.

10. SuperFabric® brand material is used in a number of footwear products, such as work boots, athletic shoes, military boots, hiking boots, trail running shoes, and mountaineering boots. Ex. A, pages 18-21.

11. SuperFabric® brand material is used in a variety of law enforcement applications, such as protective search gloves, arm guards, and fast rope gloves. Ex. A, pages 22-24.

12. SuperFabric® brand material is used in a number of industrial applications, including sheet metal handling gloves, glass handling gloves, meat processing aprons, arm guards, and chaps. Ex. A, pages 25-28.

13. SuperFabric® brand material is also used in cleaning applications. It is used for residential cleaning (kitchens, bathrooms, garage, and laundry rooms) as well as in industrial cleaning applications, including machine shops and in the automotive arena. Ex. A, pages 30-31.

14. SuperFabric® brand material is widely recognized in multiple industries and by researchers and scientists as an innovative and a superior product.

15. HDM was named as a finalist in Minnesota's 2001 Tekne Awards (recognizing technology achievements) for innovation in the development and commercialization of SuperFabric® brand materials. Ex. B, page 29-32. SuperFabric® brand material was recognized because it delivers "'locally hard' performance for penetration, cut and abrasion resistance, while maintaining flexibility for wearer comfort." The "small, specially shaped guard plates of hard materials" used in SuperFabric® brand material were recognized as offering "superior cut and puncture resistance, significantly greater cost-effectiveness and greater versatility in creating thin, lightweight flexible products" compared to Kevlar,

Spectra, and conventional fabrics. Ex. B, page 31. I also was named as a finalist in Minnesota's 2001 Tekne Awards for my personal contributions to the development of SuperFabric® brand material. Ex. B, page 29. HDM was the only company out of 168 entries to be named a finalist in two categories. Ex. B, page 29.

16. Gardening gloves made from SuperFabric® brand material are widely recognized as unique and superior gloves in the gardening industry. SuperFabric® gardening gloves were named "The Best of the Must-Haves" by The Joe Gardner Company in 2006. The "Best of the Must-Haves" are "the best, most unique, highest quality gardening products." Ex. A, page 28. The award was based on the superior puncture resistance of the SuperFabric® gloves compared to heavyweight knit gloves and coated rubber gloves. A number of other publications have recognized the superior nature of gardening gloves made from SuperFabric® brand material. For example, *Reader's Digest* featured a paragraph on gardening gloves made from SuperFabric® brand material in its May 2003 issue. Ex. B, page 13. A QVC advertisement, dated April 2003, featured gardening gloves made with SuperFabric® brand material. Ex. B, page 15. *Flower and Garden* featured a paragraph on garden gloves made from SuperFabric® brand material describing the gloves as "made from a revolutionary new material" in its February 2002 issue. Ex. B, page 18. *Floral Management* ran an article on gardening gloves made from SuperFabric® brand material in its December 2001 issue, where it described the gloves as "lightweight, flexible, comfortable to wear, and offer[ing] superior protection against cuts and puncture." Ex. B, page 21. *Greenhouse Product News* stated "[t]his new garden glove, produced by HDM, is capable of resisting the puncture of piercing cactus thorns and has been shown to dramatically reduce cactus related injuries" and "SuperFabric gloves have also been proven to drastically reduce the number of crew members needed to transport and plant cacti" in its October 2001 issue. Ex. B, page 26. *Desert Highlands* stated in its Sept. 2001 issue that SuperFabric® brand material had "enabled our landscape maintenance crew to handle cactus and other thorny plants safely. These gloves also reduce the risk of injury when reaching under a bush and encountering black widows, tarantulas or scorpions." Ex. B, page 36. All of these benefits

provided by garden gloves using SuperFabric® brand material arise from my invention of printing hard, closely-spaced resin plates on a flexible substrate, resulting in a unique combination of protection, tactility, and flexibility.

17. The Lindy Fish Handling Glove, made from SuperFabric® brand materials, is widely recognized as a unique and superior glove in the fishing industry. The Lindy Fish Handling Glove was featured in the December 2001 issue of *Field & Stream* as the "Best of the Best." Ex. B, pages 22-23. The Glove was listed in "Stuff You Gotta Have" because of its "great protection against cuts and puncture from knives, fish teeth, gill plates, and hooks." Ex. B, pages 22-23. Actual sales of the Lindy Fish Handling Glove including SuperFabric® brand material during the Glove's launch period of the 2001 fishing-tackle season were almost four times the projected sales. Ex. B, page 37. Other publications have recognized the superior nature of the Glove. For example, the *New Jersey Angler* described "the SuperFabric Fish Handling Glove" as "the ultimate in protection" and designed to "provide maximum user comfort and flexibility" in its October 2001 issue. Ex. B, page 27. The *North American Fisherman* gave its "Seal of Approval" to the Lindy Fish Handling Glove using SuperFabric® brand material in its October 2001. Ex. B, page 27. *Booster* featured an article on the Lindy Fish Handling Glove using SuperFabric® brand material as a "key item" in its January 16, 2002 issue. Ex. B, page 19. An advertisement in the July 2001 issue of *Fishing Tackle Retailer* featured a Lindy Fish Handling Glove made from SuperFabric® brand material. Ex. B, page 33. Ken Schultz, the Angling Authority, said there was "no better glove for handling fish" than the Lindy Fish Handling Glove made from SuperFabric® brand material, and described the Glove as an "ingenious glove providing excellent grip, too, while protecting hands" and "absolutely terrific." Ex. B, page 35. These recognized benefits of the Lindy Fish Handling Glove made from SuperFabric® brand material are derived from my invention of printing hard, closely-spaced resin plates on a flexible substrate, resulting in a unique combination of protection, tactility, and flexibility. .

18. Industrial gloves made from SuperFabric® brand material are widely recognized as unique and superior gloves in the home improvement and industrial arenas. Gloves made

from SuperFabric® brand material were featured in the "Top 10 Picks from National Hardware Show" on *HomeFront.com*, August 2001. Ex. B, page 34. The gloves were picked because they "are lightweight, flexible, comfortable, puncture and cut resistant, washable, and stain resistant." Ex. B, page 34. An article on industrial gloves made from SuperFabric® brand material in January 2002 of *Jobsite*® described the gloves as "crafted from a revolutionary cut- and puncture-resistant fabric material." Ex. B, page 20. *New Equipment Digest* featured an article on industrial gloves made from SuperFabric® brand material in its October 2001 issue. Ex. B, page 25. These recognized benefits of industrial gloves made using SuperFabric® brand material stem from my invention of printing hard, closely-spaced resin plates on a flexible substrate, resulting in a unique combination of protection, tactility, and flexibility.

19. Protective gloves made from SuperFabric® brand material are widely recognized as unique and superior gloves in the security and law enforcement arenas. Damascus, which sells uniforms and apparel, advertised its Damascus® V-Force® SuperFabric® Gloves in the *Galls Law Enforcement Buying Guide* (2004) as "engineered with U.S. made SuperFabric brand material on the palms and fingertips for the utmost cut-, puncture-, and abrasion-resistant glove available while also providing the most flexibility." Ex. B, page 7. HexArmor®, which sells protective products made from SuperFabric® brand materials and displaying the SuperFabric® mark for use in health care, waste management, and law enforcement, ran two full page advertisements in *Industrial Safety and Hygiene News* (March, 2007) featuring HexArmor® products made with SuperFabric® brand material. Ex. B, pages 2-3. HexArmor® described the products it offered using SuperFabric® as offering "unmatched protection, durability and flexibility." Ex. B, page 2. HexArmor® repeatedly refers to the SuperFabric® materials used in its products in these advertisements. HexArmor®, named one of Michigan's Top 500 Companies to Watch in 2006, was mentioned along with SuperFabric® brand material in *Industrial Safety and Hygiene News* in October 2005. *See* www.HexArmor.com. The utmost cut-, puncture-, and abrasion-resistance and flexibility and unmatched protection, durability, and flexibility provided by

SuperFabric® brand material and recognized by HexArmor® arises from my invention of printing hard, closely-spaced resin plates on a flexible substrate, resulting in a unique combination of protection, tactility, and flexibility.

20. *Popular Mechanics* recognized the superior performance of gloves using SuperFabric® brand material in its May 2002 issue. Ex. B, page 16. *Popular Mechanics* described the gloves as "surprisingly flexible given that the material has significantly greater resistance to puncture, wear and cutting than almost any other commonly available glove material." Ex. B, page 16. This surprising flexibility and significantly greater resistance stems from my invention of printing hard, closely-spaced resin plates on a flexible substrate, resulting in a unique combination of protection, tactility, and flexibility.

21. *Popular Science* magazine recognized the superior performance of gloves using SuperFabric® brand material in its March 2002 issue. Ex. B, page 17. *Popular Science* described the gloves as "25 times stronger than traditional gloves, yet just as soft as flexible." Ex. B, page 17. *Popular Science* stated the "key advance" was my invention of "a special silk screening process that adds each new layer before the previous one hardens." Ex. B, page 17.

22. A number of other industry and research publications have recognized the unique features of SuperFabric® brand material. The National Aeronautic and Space Administration ("NASA") tested SuperFabric® brand material for use in gloves and the knees of a NASA space suit in 2005. Ex. B, page 6. SuperFabric® brand material was used by the top three finalists in the 2006 Safety Fabrics Student Design Challenge sponsored by the Industrial Fabrics Association International. Ex. B, page 4. SuperFabric® is listed in "*Protective Clothing and Gear: Body/Vehicle Armor, Fire, Chem/Bio*," Business Communications Company, 2005. Articles featuring products made from SuperFabric® brand material appeared in the *Smithsonian Extreme Textiles Book*, 2005. Ex. B, page 5. A glove made from SuperFabric® brand material was featured on the cover of the Industrial Fabrics Association International Expo promotional brochure, 2004. Ex. B, page 8. An

advertisement for gloves made from SuperFabric® brand materials appeared in the Hubert products buying guide. Hubert Source Book 2004, Spring/Summer 2004. SuperFabric® brand material was featured on the front cover of and in an article in the *Industrial Fabric Products Review* in December of 2003. Ex. B, page 9-11. Minneapolis/St. Paul and Chicago television stations aired segments on products made with SuperFabric® brand material on March 8, 2002, June 18, 2002, and November 13, 2003. Ex. B, page 14. The Qulex Super Scrub Pad, made with SuperFabric® brand material, received the Cooking Club of America's Kitchen Tested Seal of Approval in January 2003. Ex. B, pages 39-42.

23. In conclusion, SuperFabric® brand material enjoys great commercial success and industrial recognition as a result of its unique nature and the benefits it provides. The advantages of SuperFabric® brand material caused Governor Arne Carlson of the State of Minnesota in 1997 to issue me a Certificate of Commendation for my invention of SuperFabric® brand material. The commercial success of SuperFabric® brand material results from the unique combination of protection, tactility, and strength provided by SuperFabric® brand material, which is directly linked to my invention of printing hard, closely-spaced resin plates on a flexible substrate.

24. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

June 8, 2007
Date

YOUNG-HWA KIM